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## (54) Apparatus for marking objects

(57) Apparatus for marking objects (11) which are conducted past a marking jet discharging head (13) has a plurality of colour jet orifices (26) for producing

dots defining a character. The orifices (26) are arranged in at least one row, and the head (13) is pivotable about an axis (21) perpendicular to the surface (20) to be marked, to vary the inscription height i.e. higher characters being produced in Fig. 4 than in Fig. 5. Discharge of dots is controllable so that upright characters can be produced irrespective of the pivoting of the head (13). The discharge orifices (26) can be arranged in two rows (see Fig. 7) to produce more compact characters.

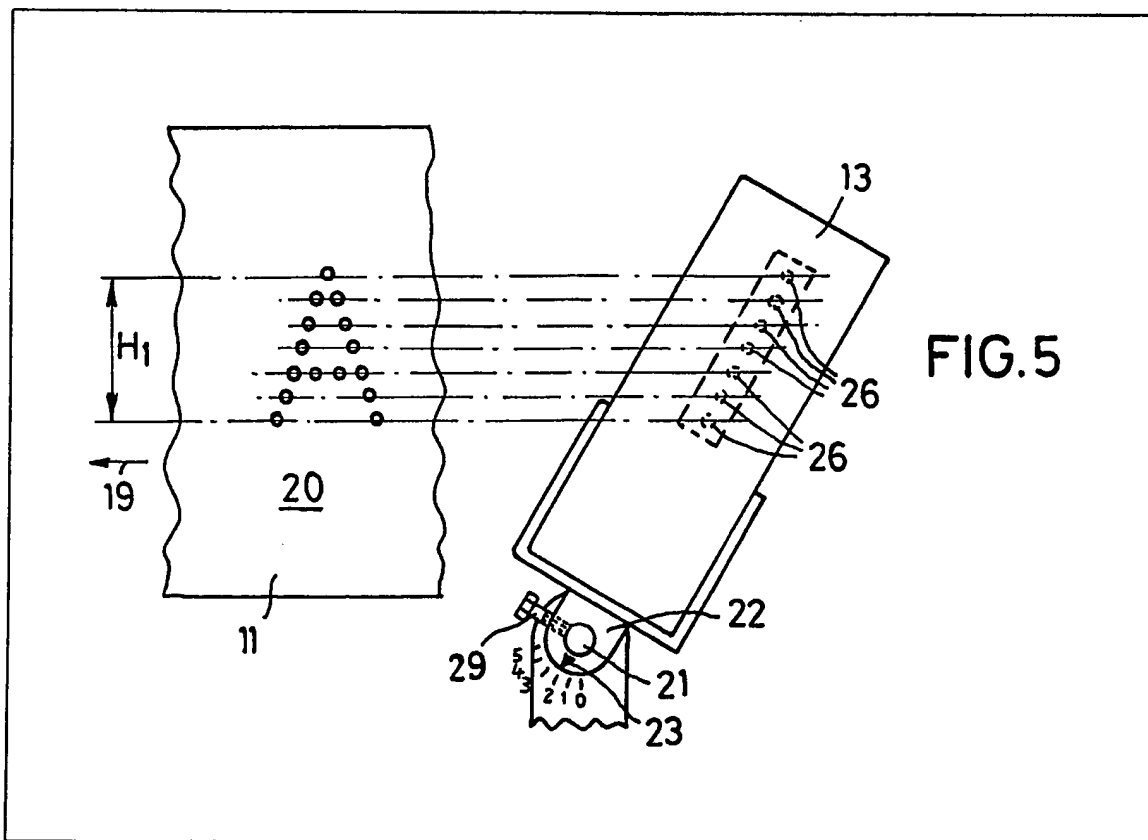


FIG.5

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FIG.1

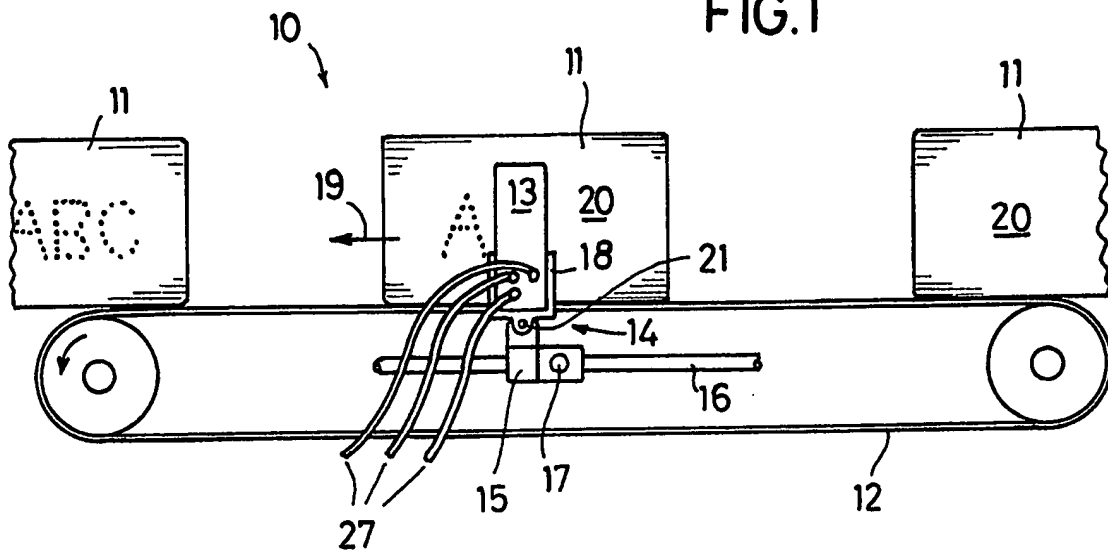


FIG.2

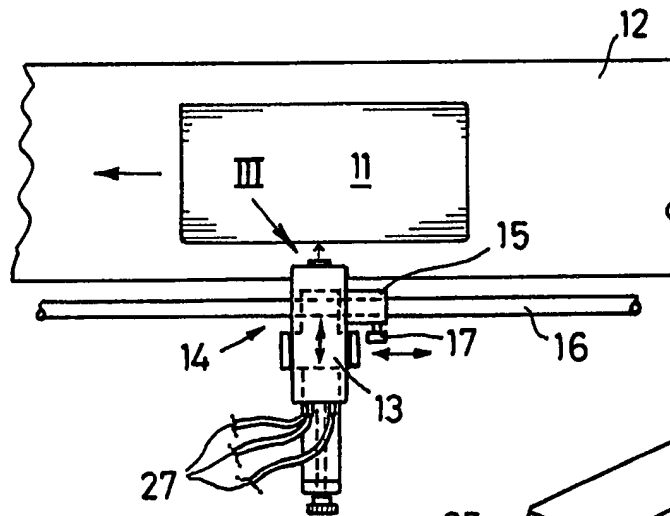


FIG.3

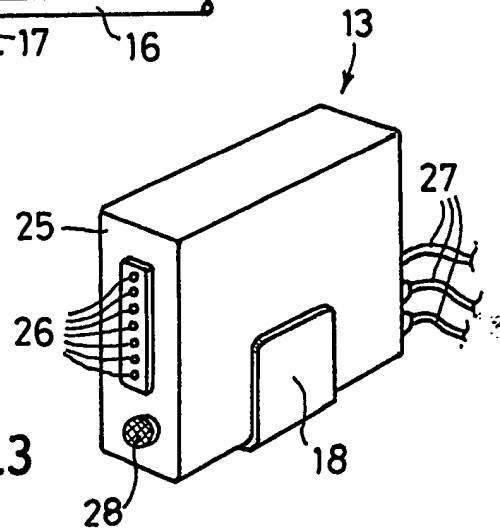


FIG. 4

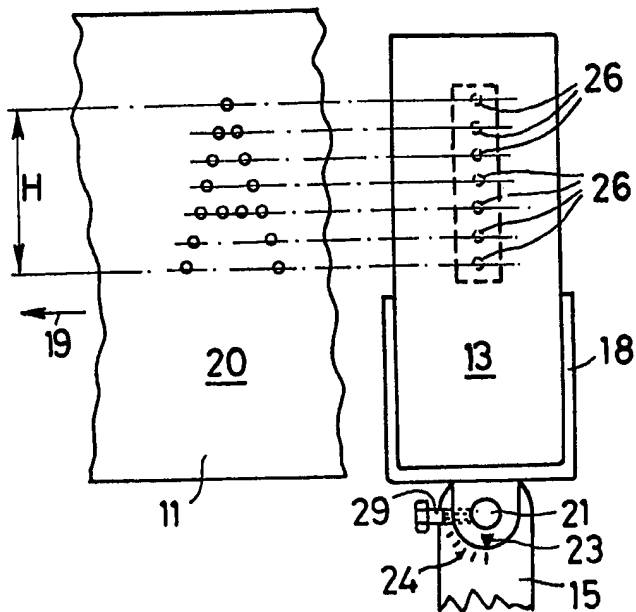


FIG. 7

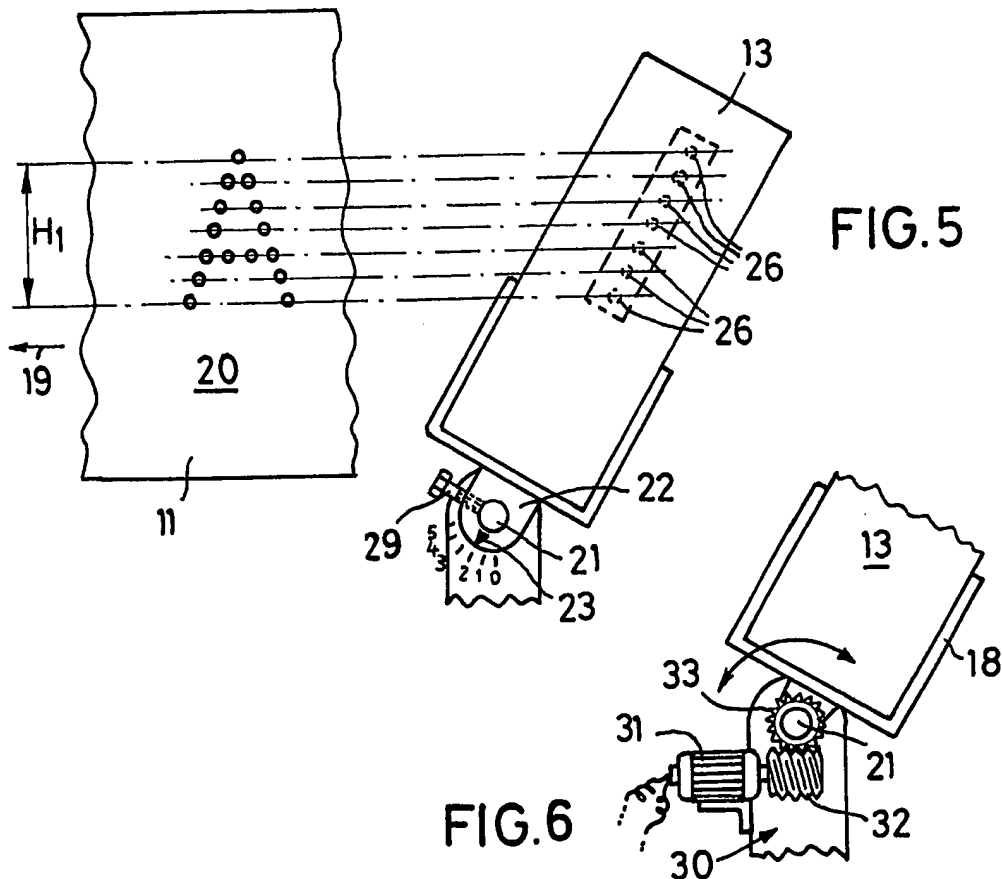
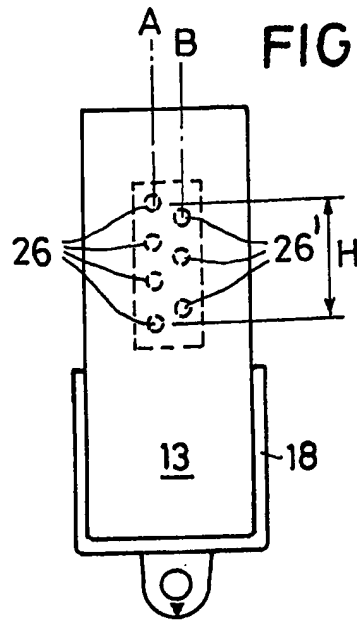
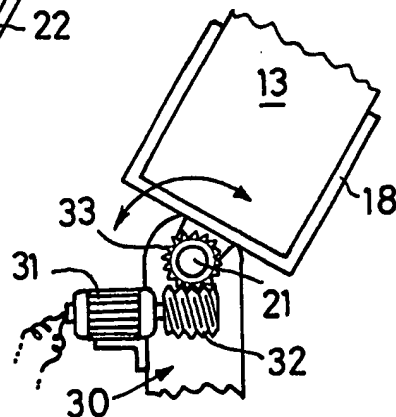


FIG. 6



## SPECIFICATION

## Apparatus for marking objects

The invention relates to an apparatus for the marking of objects. It particularly relates to apparatus having a colour jet discharging head past which the objects are conducted and which comprises a plurality of orifices for the discharge of a marking fluid or colour. The orifices are arranged one above the other, and have individually closable openings which are briefly opened by a control apparatus at such time intervals as to produce dots of colour on the articles being conducted past; these dots together form the desired marks.

A marking apparatus of this kind is known whose colour jet discharging head is pivotably movable so as to allow the production of not only vertical but also sloping inscriptions, wherein the major axis of the letters is inclined at a small angle relatively to the vertical. It is also known to produce scripts of different heights with the same jet discharging head (German laid-open specification 29 15 646). For that purpose, in the case of the known apparatus a larger number of colour jet orifices are provided in the lower portion of the colour jet discharging head than in the upper portion, so that for marking with a relatively small script there are just as many colour jet orifices available as when marking with a relatively large script, in which latter case only each second or third orifices in the lower portion in the colour jet discharging head is used.

Since only a limited number of colour jet orifices can be accommodated per unit of height, the known apparatus can produce only a few different script heights, and the height of these is fixed from the outset.

According to the present invention there is provided apparatus for the marking of objects with characters, comprising: a marking jet discharging head relative to which the objects are displaced for marking, said head comprising means defining a plurality of mutually spaced marking jet orifices arranged in a row; means for passing fluent marking material through said orifices; a plurality of means operable to open and close respective orifices selectively, to control the passage of marking material; and means for controlling said opening and closing means to enable the production of dots of marking material on the objects, which dots together form the desired characters; and pivotable mounting means for said head arranged so that the head is movable pivotably about an axis extending substantially perpendicularly to the expected plane of a surface of an object to be marked, and can be secured in a plurality of angular positions; and wherein the means for controlling the opening and closing means are arranged to effect said controlling in respective modes adapted to respective angular positions of the head and on the speed of the objects relative to the head, whereby upright characters of different desired heights are producible by varying said angular position.

In another aspect there is provided a method for marking an object with characters, comprising providing a marking jet discharging head, said head comprising means defining a plurality of mutually spaced marking jet orifices arranged in a row; means for passing fluent marking material through said orifices; a plurality of means operable to open and close respective orifices selectively, to control the passage of marking material; and means for controlling said opening and closing means; displacing said object relative to said head; pivoting said head so that the total extent of the orifices in a direction perpendicular to the displacement direction corresponds to the desired height of the characters; feeding marking material to the orifices; and controlling the opening and closing means so that passage of material through the orifices leads to dots of the material on the object defining the desired characters, the arrangement being such that the characters' height is determined by the pivotal position of the head, and their orientation is determined by the operation of the controlling means.

The invention enables one to construct a marking apparatus with which a very large number of scripts of different heights can be produced, and the script height is infinitely adjustable.

Changing the angular position of the head changes the vertical spacing of the orifices, and thus the total height of the script produced. It is not necessary to use different orifices or orifice combinations for letters of different heights. It is also possible by pivoting the colour jet discharging head within wide limits to continuously adjust any desired script height which happens to be required. This avoids distortion of the script face produced by the colour jet orifices when the head is in an inclined situation. Thus when the colour jet discharging head is inclined, with the present invention it need not be a sloping script which is produced; it can be an upright script, but of lower height than the script produced with the head positioned vertically.

The colour jet discharging head is conveniently arranged in a holder which is mounted to be pivotably movable and clampable on a support. The colour jet discharging head can be moved pivotably by hand and clamped with a clamping screw, but it is also possible to provide the colour jet discharging head with a motor drive for causing pivotable movement. It is also advantageous if the colour jet discharging head is displaceable parallel and/or perpendicularly to that surface of the objects which is to be marked, so as to define the beginning of the inscription on the objects being marked, and to allow varying the size of the dots of colour produced by the jet orifices and adaptation to the modified inscription size.

Since the inscription characters which are to be produced in accordance with the usual matrix require at least seven colour dots situated one above the other, and the colour jet orifices cannot be made very small, the basic inscription height which can be produced with the known jet

discharging heads is limited in the sense of how small it can be. Therefore it is particularly advantageous to arrange the colour jet orifices in the colour jet discharging head in a plurality of rows situated adjacent one another, and to offset the jet orifice rows in such a manner relatively to one another in the longitudinal sense that the jet orifices of one row are situated between the jet orifices of the neighbouring row. As a result it is possible when still in the basic position, which is usually vertical, to arrange seven colour jet orifices of conventional construction over a very small height, so that it is possible with this invention to produce small inscriptions already with a relatively small inclination of the colour jet discharging head.

It has also been found advantageous to maintain the direction of inclination of the colour jet discharging head independently of the speed at which the objects conducted past are being conveyed. The control arrangement of the colour jet orifices then has simply to be reversed for the opposite direction, and no further modifications are required otherwise.

Further features and advantages of the invention are shown in the following description and the drawings, which show in detail preferred constructional forms of the invention by way of example. In these drawings:

Fig. 1 shows an apparatus for marking of packages embodying the invention, in rear view,

Fig. 2 shows part of the apparatus from above,

Fig. 3 shows a colour jet discharging head in a perspective view,

Fig. 4 shows the apparatus with the head disposed vertically for production of the maximum inscription height, in a rear view together with a fragment of the package which is just being taken past the colour jet discharging head,

Fig. 5 shows a view corresponding to Fig. 4 with the colour jet discharging head inclined, for production of an inscription of lower height,

Fig. 6 shows a detail of the means for pivoting a colour jet discharging head, and

Fig. 7 shows another constructional form of the colour jet discharging head in a view corresponding to Fig. 4.

In the drawings, 10 designates an apparatus for the marking of packages 11 which are taken past the colour jet discharging head 13 of the marking apparatus on a conveyor belt 12 which circulates at a continuous speed. The head 13 is held by a supporting device 14 laterally adjacent the conveyor belt 12. The supporting device 14 comprises a support 15 which is displaceable parallel to the conveyor 12 on a slideway bar 16 arranged near the conveyor 12 and can be clamped fast to the slideway bar 16 with a clamping screw 17. In the upper portion of the support 15 a U-section holder 18 is mounted to be pivotably movable with bearing brackets 22 on a pivot pin 21 which is arranged at right angles to the conveying direction 19 and to the surface 20 being marked. One of the bearing brackets 22 bears a mark 23 which when the holder 18 is

moved pivotably about the pin 21 moves past a scale 24 provided on the support 15, so that the particular angular position of the holder 18 at the time, and that of the colour jet discharging head 13 secured held therein, can be read off.

At its face 25 directed towards the surfaces 20 of the packages 11 which are to be marked, the colour jet discharging head 13 has a plurality of colour jet orifices 26 situated in a line one above the other. They have individually closable openings which are controllable in accordance with a pre-determined program by a control apparatus (not shown) so that, when a package travels past, the colour jet orifices open and close in a pre-determined sequence. They thus discharge small quantities of colour onto the surface 20, and thereby produce dots of colour which together form the desired characters, letters, numbers or the like. The forming of such characters or the like on objects taken continuously past such heads is per se known and therefore will not be described in detail here.

The colour jet discharging head 13 is connected via control lines 27 to the control apparatus. The head 13 has at its face 25 directed towards the package 11 a photoelectric cell 28 which is offset laterally relatively to the row of colour jet orifices. This is for detecting the front edge of the package being taken past the head 13 and, in response to such detection, switching on the marking apparatus, possibly with some delay, to make it begin the programmed marking.

To make it possible to hold the holder 18 in various angular positions, in the constructional form shown in Figs. 4 and 5 a clamping screw 29 is provided which is screwed into the bearing bracket 22 and acts on the pin 21. The colour jet discharging head 13 is also capable of being shifted in the holder 18 transversely to the direction of advance 19 of the packages, so that the spacing of the colour jet discharging head orifices 26 from the surface 20 to be marked can be varied.

The control apparatus, which is not shown here, opens and closes the colour jet orifices at a speed and in a sequence which depend on the kind of character to be formed, the angular position of the colour jet discharging head, and the speed at which the objects are transported past the colour jet discharging head. The angular position of the colour jet discharging head can be put in manually, but alternatively it is also possible to provide electronic angle measuring elements which detect the particular angle setting of the colour jet discharging head and transmit the setting as actual value data to the control apparatus.

In their vertical position shown in Fig. 4 the colour jet orifices 26 produce characters with the maximum possible inscription height H. Here, when the package 11 is taken past in the direction of the arrow 19, to produce the letter A the colour jet orifices 26 are successively actuated first of all upwardly from below, and then downwardly from above, and during the operation the third colour

jet orifice from the bottom is actuated four times in succession to produce the cross-bar of the A.

If it is desired to produce on the surface 20 of the package 11 which is to be marked an inscription of lower height  $H_1$  (Fig. 5), the colour jet discharging head 13 is moved pivotably about the pivot pin 21 in the clockwise sense, and secured with the clamping screw in the position which is shown in Fig. 5 and in which the marking 23 is opposite the line 2 of the graduation. Since the inclination to the horizontal of the head 13 and of the row of colour jet orifices is smaller than that of the right-hand leg of the letter A being produced, first of all the uppermost colour jet orifice and then in rapid succession the colour jet orifices which follow it in downward direction are opened. A plurality of colour jet orifices may need to open at the same time, e.g. here the second and sixth orifices (counting from the top), since these orifices simultaneously overlie the sites for respective dots (in different legs of the A).

It will be appreciated that the conveying direction 19 of objects 11 being taken past the colour jet discharging head 13 may also be reversed. It is then simply necessary to make the control for the colour jet orifices run backwards, so that the characters begin with the last letter of the inscription to be produced on the package 11, i.e. the inscription is, as it were, written backwards. The colour jet discharging head 13, however, must then retain its original direction of inclination, for example the direction shown in Figs. 5 and 6. This occurs for example when a package is to be inscribed on two opposite sides. In this case colour jet discharging heads are provided at two sides of the conveyor, both being inclined either in the direction of travel or oppositely to the direction of travel of the conveyor belt, and the colour jet orifices of one colour jet discharging head are directed towards one side and the colour jet orifices of the other head towards the opposite side of the package being conducted past on the conveyor. The colour jet discharging head which is situated on the left of the conveyor considered in the direction of travel then writes the inscription forwards, or from left to right, whereas the colour jet discharging head which is situated on the right-hand side in the direction of travel of the conveyor applies the inscription backwards on the package, i.e. beginning with the last letter.

Whereas manual adjustment of the colour jet discharging head 13 is provided in Figs. 4 and 5, in Fig. 6 a constructional form is illustrated wherein the holder 18 can be swung about its pivot pin 21 with a motor type of pivoting drive 30. For this purpose a small electrically operated servomotor 31 is provided which drives a worm 32 which rotates a worm wheel 33 mounted securely on the pivot pin 21. When the motor 31 is switched on in one or other direction the holder 18 can be pivoted into an inclined position or returned to an upright position.

In the other constructional form which is shown in Fig. 7 the colour jet orifices 26 are arranged in two rows A and B which are situated beside one

another, the colour jet orifices 26' of row B being so offset in the longitudinal direction of the rows relatively to the colour jet orifices 26 of row A that the colour jet orifices 26' of row B are situated between the colour jet orifices 26 of row A. Thus the colour jet orifices 26 and 26' are in a sense staggered relatively to one another, so that they can be set closer together, and the basic height  $H$  of the colour jet orifices can be kept lower than if all the colour jet orifices are arranged one above the other in a row. In this way still smaller inscription heights can be achieved, and of course it is necessary to control the colour jet orifices somewhat differently, in order to produce correct-configuration characters.

#### CLAIMS

1. Apparatus for the marking of objects with characters, comprising: a marking jet discharging head relative to which the objects are displaced for marking, said head comprising means defining a plurality of mutually spaced marking jet orifices arranged in a row; means for passing fluent marking material through said orifices; a plurality of means operable to open and close respective orifices selectively, to control the passage of marking material; and means for controlling said opening and closing means to enable the production of dots of marking material on the objects, which dots together form the desired characters; and pivotable mounting means for said head arranged so that the head is movable pivotably about an axis extending substantially perpendicularly to the expected plane of a surface of an object to be marked, and can be secured in a plurality of angular positions, and wherein the means for controlling the opening and closing means are arranged to effect said controlling in respective modes adapted to respective angular positions of the head and to the speed of the objects relative to the head, whereby upright characters of different desired heights are producible by varying said angular position.

2. Apparatus according to claim 1, wherein the head is arranged in a holder, and the head mounting means comprises a support in which the holder is mounted so as to be capable of moving pivotably and being clamped in position.

3. Apparatus according to claim 1 or 2 wherein the head mounting means comprises a clamping screw for selectively securing said head and allowing manual pivoting thereof.

4. Apparatus according to any preceding claim including a motor-operated drive means for pivoting said head.

5. Apparatus according to any preceding claim wherein said head is arranged to be displaceable parallel to said expected surface plane.

6. Apparatus according to any preceding claim wherein said head is arranged to be displaceable perpendicularly to said expected plane.

7. Apparatus according to any preceding claim wherein said head has means defining a plurality of mutually adjacent rows of said orifices, the rows being so arranged relative to one another in

the longitudinal direction that the orifices of one row are situated between the orifices of the neighbouring row.

5 8. Apparatus according to any preceding claim wherein the means for controlling the opening and closing means is arranged to permit the direction of inclination of the head to be maintained independently of the direction of displacement of the objects relative to said head.

10 9. A method for marking an object with characters, comprising providing a marking jet discharging head, said head comprising means defining a plurality of mutually spaced marking jet orifices arranged in a row; means for passing  
15 fluent marking material through said orifices; a plurality of means operable to open and close respective orifices selectively, to control the passage of marking material; and means for controlling said opening and closing means;  
20 displacing said object relative to said head; pivoting said head so that the total extent of the

orifices in a direction perpendicular to the displacement direction corresponds to the desired height of the characters; feeding marking material  
25 to the orifices; and controlling the opening and closing means so that passage of material through the orifices leads to dots of the material on the object defining the desired characters, the arrangement being such that the characters' height is determined by the pivotal position of the head, and their orientation is determined by the operation of the controlling means.

30 10. A method according to claim 9 including a step of programming the controlling means so that upright characters are produced however the head is pivoted.

35 11. An apparatus or method for the marking of objects substantially as any herein described with reference to or as illustrated in Figs. 1—5 or in  
40 Figs. 1—6, and/or as modified by Fig. 7 of the accompanying drawings.